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On the process adopted by nature in the restoration of wounded parts, and other injuries of the human system —

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of Virginia

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For the Spring of

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On the process employed by nature in the restoration of wounded parts, and other injuries of the human system —

A wound has been defined, a solution in the continuity of a part, communicating internally, and produced by mechanical violence

Wounds differ in their nature, and appearances, from a variety of circumstances — they admit however, of a general division into incised, and contused, the latter including punctured, lacerated, and gunshot wounds. Incised wounds are made with a sharp cutting instrument, and the parts sustain no injury, Contused wounds, are those in which the surrounding parts are bruised and injured —

Of Incised Wounds

When these are of small extent, and made in fleshy parts unaccompanied by a division

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division of any considerable blood vessel, the surgeon, by causing to approximate the sides of the wound, and retaining them in contact enables them to unite; and they speedily heal. All incised wounds are attended by some loss of blood, and this in many instances so great, as to form the chief danger of the case. As there is no subject of greater importance to the surgeon, than that of hemorrhage, it may not be improper here, to offer a few remarks upon it.

Of Hemorrhage.

In regard to the best means of arresting hemorrhage, they may readily be arranged under two heads, (to wit) that furnished us by art, and that which more strictly depends on the operations of nature alone; Of the former, as they would come more particularly within the province of the surgeon, I shall say but little, of the latter, the following extract from the writings of Dr. Jones, I deem fully adequate to the purpose in view without

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In order to ascertain the natural process by which the bleeding from a wound is arrested, It is requisite to attend to some of the phenomena, which follow the opening of large blood vessels. It is now nearly a century since Mr Petit, commenced the investigation of the present subject, and since his time, a variety of theories have been advanced, to explain the natural means by which the bleeding from divided arteries is stopped.

Dr. Jones, in an able publication on this subject, has collected into one view, these various and discordant doctrines, has selected from each, what appeared founded upon fact and by very numerous, and interesting experiments, appears to have gone far in developing the truth.

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By these experiments he ascertained that the sides of the arteries, were divisible into three coats. The internal one, is extremely thin, and smooth, it is elastic and firm, (considering its delicate structure) in the longitudinal direction, but so weak in the circular as to be very easily torn by the slightest force applied in that direction. Its diseases shew that it is vascular and it is also probably sensible.

The middle is the thickest, and is composed of muscular fibres, all arranged in a circular manner, they differ however from common muscular fibres in being more elastic, by which they alone keep a dead artery open, and of a cylindrical form. As this middle coat has no longitudinal fibres, the circular fibres are held together by a slender connexion, which yields readily to any force applied in the circumference of the artery —

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The external coat is remarkable for its whiteness, density, and great elasticity; when an artery is surrounded, by a ligature to the middle, and internal coats are as completely divided as they could be by a knife, while the external coat remains entire —

Besides these two coats, all the vessels in their natural situation are connected by means of the fine cellular substance, with surrounding membranous sheaths. If an artery be divided, the divided, hardening, to their elasticity recede from each other, and the cellular substance connecting the artery, with the sheath, acquires a form resembling a certain way within the sheath —

Another important fact is that when an artery is divided, or tied, extremities contract in a greater, or less degree, and the contraction is generally, if not always

permanent

ment.

Arteries are furnished with absorbents, veins, absorbents and nerves, a structure which makes them susceptible, of every change, which living tissues are subjected in common, which causes them to inflame, when injured, and to throw out exudating lymph, by which the injury is repaired, or the tube permanently closed.—

Hence, by a series of experiments on animals, Dr Lowe, was led to the conclusion that in time, the action, and even the structure of the arteries, their sheath, and the cellular substance connecting them with it, are so, in this bleeding from a divided artery, of moderate size, in the following manner, an imbecilous flow of blood, a sudden and forcible retraction of the artery, with its sheath, a slight contraction of its extremity

Finally are the immediate and almost simultaneous effects of the division. The natural impulse however, with which the blood is seen to, in some measure counteracts the retraction, and necessitates the contraction of the artery, flows freely, momentarily, or is extravasated into the surrounding cellular membrane, in proportion to the open or confined state of the wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating or stretching the cellular fibres that connect them. These fibres entangle the blood as it flows, and thus the foundation is laid for the formation of a coagulum, at the mouth of the artery; and which appears to be compleated by the blood as it escapes from the gaping canal of the trunk, gradually increasing, and coagulating around its internal surface, till it completely fills it up from the circumference, to the centre.

The effusion of coagulable lymph
[illegible] cellular membrane, and between
the artery and its sheath, but in particular,
the diminished force of the circulation
from loss of blood, as a necessary consequence of
the fluid, by circumscribing, chiefly
contributes to arresting the destructive effects
of bleeding here, that recurrent, which
we have called the external one at the mouth of
the artery, and within its sheath, forming the
most insuperable obstacle to the continuance
of the bleeding, and though it seems external
to the artery, not
[illegible] within the sheath, its termination
can be plainly observed with the coagulum
thrusted into the mouth, and contained in
its sheath — —

The collateral branch being at
rest, the interrupted mouth of the artery,
the blood just within it is at rest and
usually

[illegible] giving a [illegible] conical configuration, and neither filling up the canal of the artery nor adhering to its sides, except by a small portion of the circumference of its base, near the extremity of the vessel. This coagulum is distinct from the former, which may be called the external one —

The cut end of the artery next inflames, and the vessels [illegible] pour out lymph, which fills up the extremity of the artery, is situated between the external and internal coagulums, is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the vessel. Dr Jones farther states that the permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph, but that the end of the artery is also secured by a gradual contraction which it undergoes, and by an effusion of lymph between its tunics, and into the circumjacent)

[illegible] of cellular substance, whereby those coats become thickened and incorporated with each other, that one cannot be discerned from the other. Does the wound in the integuments not heal by the first intention, the coagulating lymph being effused, determines the [illegible] of adhering to the adjacent and lateral parts, forms a new covering, more externally as it does from the outward wound. —

The same circumstances are [illegible] in the portion of the upper, most removed from the heart. Its orifice however is generally more contracted, and its external [illegible] than the one which attaches itself to the other cut end of the artery —

The impervious extremity of the artery no longer allowing blood to circulate through it, the portion which lies between it and the first lateral branch, gradually con

contracts

[illegible] early & completely obliterated, and to induce upon a diminishing absorption of the external coagulum which in the first instance had stopped the hemorrhage & altered the tissues, and the coagulation of lymph upon wounded surfaces, and by which [illegible] adhesions, & finally remove, so that they resume again their cellular texture. —

[illegible]

[illegible] a diminishing state, [illegible] completely obliterated, [illegible] the first intention, [illegible] lower [illegible] which [illegible] is accomplished, the inosculation of vessels now become universal, and [illegible] as free communication between the dissected parts is established [illegible] —

[illegible] very [illegible] diseases

ad

some distance from a lateral branch, for coagulum formed of blood, or = wanting, which shuts it at the mouth; one limb, just within the extremity of its canal, and one of blood, within its cavity, contiguous to that of the limb, in which artery has been tied, near a lateral branch, no internal coagulum of blood is formed —

The internal coagulum is always formed, when the divided artery is left to itself; but in ligature, if not interfering, for instance the obliteration of the ligature is one performed by agaric, lycoperdon, or sponge, its form is not so doubtful, the coagulum, when the decay of the part is not used; but the internal coagulum will be equally formed, whether the treatment is antiphlogistic or not, if no collateral branch is near the immediate extremity of the ar-

tery;

[illegible] in a healthy, diseased, [illegible] or [illegible] quantity, forms a distinct substance, just as the mouth of the artery, [illegible] to [illegible] of the hemorrhage permanently subsides —

Of the means which nature [illegible] in the suppression of hemorrhage, from [illegible], or partially divided, arteries —

The suppression of hemorrhage is much more easily accomplished, by the natural means, when an artery is completely divided, than when merely punctured, partially divided; [illegible] divided artery, was one very practised by the ancients, in order to stop hemorrhage [illegible] moxa frequently in the same [illegible], when bleeding from the temporal artery proved troublesome —

distan

If an [illegible] artery of a certain size [illegible] of an artery it is only partially divided, or punctured, the cessation of bleeding is not so readily effected by natural means; hence it was the custom of the Ancients in such instances to divide completely a punctured artery.

Mr Petit [illegible] [illegible] [illegible] a great number of experiments [illegible] with a view to elucidate the subject [illegible] that he [illegible] [illegible].

The blood infiltrates into the cellular substance, between the vessel and its sheath, for some distance, both above and below the wounded part; and when the parts are examined, at short time after the hemorrhage has completely stopped, we find a clot of coagulated blood between the artery and its sheath, extending from a few inches below the wound

and.

[illegible] the [illegible] [illegible] [illegible]

vascularized there, preventing any further effusion of blood, — —

The coagulated blood, filling the external coat of a divided artery, affords only a temporary barrier to the hemorrhage, the permanent obstruction of the vessel being effected by a process of repairation, or obliteration. —

It has been asserted, by many respectable surgeons, whether arteries when divided, can heal without an obliteration of the cavity of the vessel, in such a manner as to carry on the circulation of blood. The experiments of Sir James Ware, upon a number of animals, have fully ascertained the fact, being, in the inferior animals, only to a certain extent. The cicatrization in these cases is so complete, that no vestige of the wound can

the lancet, either on the external or internal surface of the artery, and that even oblique and transverse wounds, when they do not exceed one fourth of the circumference of the vessel, are healed by an effusion of coagulating lymph from their inflamed lips, so as to occasion little or no obstruction to the canal of the artery. It may still be questioned whether in the human body the same mode of union is effected ——

When an artery of considerable magnitude is punctured, even by a sharp lancet, the circular fibres in most cases contract so much, as to separate the sides of the wound a considerable distance from each other, so as to bear as if a piece of the vessel had been removed. ~~xxxxxx~~ To effect this separation, since a coagulum forms, is explained by Mr Pelit, inside of the artery, and extends through the wound, so a coagulum will

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[illegible] on the outlines of the aorta; by this means the aperture is entirely closed, and a permanent closure takes place at the sac. [illegible] quickly, and in many cases probably a large majority of cases, [illegible] the arterial tube, further down [illegible] arteries leading to the extremities [illegible] relieved by injections, and thus the cure is completed without a closure of the internal cavity. Until recent instances of this, [illegible] in Broca's hospital as learned, treatises on aneurism, [illegible] another very decisive instance in which this mode of union was effected, in the brachial artery of a man. Carlsen says that even the larger vessels in this manner are cured radical. He supposes the [illegible] at the centre, that [illegible] any other part. Hence of [illegible] brachial artery [illegible] hence without an obliteration

[illegible] canal, has [illegible] found in the New York Med. and Phil. Journal. Vol. 4 —

Having thus stated the nature and [illegible] of hæmorrhage, attended with [illegible] I may just mention, that these bodies of [illegible] which exist in [illegible] in the eye of the [illegible], in use repeatedly healing much more readily than large ones. —

In incised wounds the flow of blood is taken up much sooner than in contused, — [illegible] of smaller bulk. The effect which has [illegible] has in bringing on hemorrhage may be [illegible] from a case related by Sheselden, in which a [illegible] was [illegible] with the [illegible] from the chest, of course [illegible] of the largest arteries of the body, [illegible] yet no fatal hemorrhage ensued — [illegible] boy was [illegible] off in a mill, within a few inches of the shoulder, under [illegible]

the bleeding resulted, as secondary, in staining clothes. Dr. Physick has attributed the great degree of confusion, 1st. To the diminished power of the solids carry on the circulation. In an open wound the solids are injured only at the divided surfaces; in a contused wound they are injured to a considerable distance, and therefore circulate the blood less readily. In a contused wound, the blood oozing from a body of the extremities, stagnates, and becomes extravasated, into the cellular tissue, in a kind of tumor, before upon the skin. In the divided vessels, in contused, the wound incised, wounds, nothing coagulation is a powerful barrier to the escape of the blood. The extremities of the vessels, being are often retracted, kinked, by the incision, and the blood, when in contact with a matter, speedily coagulates. The coagulum of blood in the divided surfaces of the vessels forms another obstacle to the hemorrhage.

Of the treatment of incised wounds

[illegible]

[illegible]

by the first intention, the adjacent parts being of
a healthy consistence, the capillaries are absorbed
and retaining their usual power of action, all
the respective functions of extravasation, absorption,
and assimilation are performed, just as though
no accident had happened. Hence the term
Union by the first intention.

This method of cure, however, cannot al-
ways be effected: And when this is the case, nature
has another plan, by which to repair the
injury. The blood here, which has in the former in-
stance ceased as the bond of union, being ut-
terly lost, and the parts becoming hard, and
dry, in consequence of their previous exposed
condition, inflammation is excited, and a suitable
eschar is thrown out, and the cure effected
in nearly the same space of time, as though
it had been done by the first intention. So
has effort of nature, the same writer, has thought
proper to apply the term Union by the adhe-

sive

inflammation in the treatment of which the duties of the surgeon, differ but little, from that of the former — the only differences consisting, in the operations of nature —

The little difference indeed is so little in those two modes of cure, that Professor Wilson, has thought proper to consider them as nearly synonymous terms, and consider that more or less inflammation must necessarily take place, before a union can be effected. Mr Hunter, however, does make a distinction; but how far such a distinction is correct — remains not for me to decide: and even were I disposed to advance an opinion; I should by no means like to place my judgement — in competition, with either of these gentlemen. —

Should the adhesive inflammation,

[illegible] hardening [illegible]
[illegible] to circulation [illegible] other
[illegible] which has been entirely removed
[illegible] gangrene [illegible]
[illegible] capable [illegible] to [illegible]
[illegible] to [illegible] the de
[illegible] obliteration is inevitable. [illegible]
[illegible] the [illegible] which [illegible]
[illegible] (every [illegible]) which is calculated
[illegible] irritate, and inflame the parts, and to
[illegible] and the most [illegible]) and emoli-
[illegible] obliterations [illegible]

In contracted wounds, there is not only
a simple solution of continuity, but there is
injury of the adjacent [illegible], greater or less
according to the nature and violence of the
[illegible] which [illegible] —

The indications of cure are to
guard against inflammation, to wait the
separation

separation of the deadened flesh, and when suppuration is established, to cause to approximate, and return in contact the sides of the wound, - -

The best local application is a boiled bread and milk poultice. If inflammation runs high, bloodletting is to be directed. If great pain or irritation come on, a healing may be used; should gangrene result, a blister is applied. — —

Lacerated wounds partake of the nature of contused wounds, but there is [illegible] more [illegible] than more common [illegible] and are seldom healed by the first intention; hence there is much [illegible] inflammation, and [illegible] ensues, this [illegible] followed [illegible] the wound, [illegible] in a lacerated wound, and the [illegible] being [illegible] by the first intention [illegible] this

the edges which were greatly incised —

In the treatment of punctured wounds, the same indications present themselves as in simple incised wounds — we are to endeavor carefully to combat the inflammatory symptoms, by a strict observance of the antiphlogistic regimen, to prevent the formation of abscesses, and to guard against secondary hemorrhage, which in these cases often prove exceedingly troublesome ——

To illustrate the several points here [illegible], the following case, which came under my own knowledge, will probably be sufficient, without my entering more largely into the discussion of punctured wounds, which [illegible] [illegible] without in any way benefiting the object in view —

[illegible] Nothing, [illegible] in the country, [illegible] chest-pieces, [illegible] a night, especially gen=
[illegible] in that country, [illegible] the middle time,
[illegible] the year 1820 [illegible] to cut a vein
[illegible], [illegible] the leg, the direction
[illegible] the tourniquet in this case, [illegible] to have
[illegible] leg, the knife [illegible] on the out=
side of the tibia, just a few inches below the
[illegible] of the fibula, [illegible] to a considera=
ble distance between the two bones of the limb
[illegible] divides completely the anterior tibial,
and interosseal arteries. But the external —
[illegible] of the [illegible] [illegible] [illegible] [illegible]
[illegible], [illegible] a free discharge of blood
[illegible] forms, and the hemorrhage
[illegible] at first, very profuse, soon [illegible]
[illegible] ceased, so that by the time the surgeon
[illegible] arrived, [illegible] immediately called
[illegible] there was no sign of bleeding whatever —

As every other [illegible] [illegible] [illegible]
times

under all circumstances, to immediately brought the edges of the wound together, & applied the adhesive strips, and over these, a very simple dressing; the patient was ordered to be kept quiet, and the wound treated, not as if it had been a simple incised wound. —

But in a few days, the patient was seized with rigors, and other symptoms indicative of suppuration, which the attending Physician, unfortunately mistaking for an attack of bilious fever, directed his remedies accordingly. Thus by entirely overlooking the local injury, for what he now assumed to be a constitutional disease, large collections of matter, and extensive sinuses were allowed to form, until the limb had become completely disorganised, & which eventuated in the loss of the limb —

Now it is my intention, that had it at such been freely, and extensively laid open, & the matter completely

shown as these symptoms, conclusively indicative of a formation of bug; has made their appearance, a profuse hemorrhage would immediately have ensued, and the nature of the case would have been fully developed, the arteries might now have been secured, if he had it in his power, and the limb—by observing the treatment—taken on such occasions, probably saved; ——

It would indeed appear incredible, but such is only as I have above noticed, should have been done without at once staining the life of the patient, in the utmost jeopardy, from the excessive hemorrhage, which it might be supposed, would necessarily have ensued. But that such was the fact can be sufficiently attested, by one of the most respectable surgeons, of our Country, who the 13th day after the accident, was called to visit the patient, thus whose bounce

* It may not be improper here to observe, that, by a careful dissection of the lunt, after its mutation to bone, its cells were distinctly seen by the operator —

ing, afterwards to amputate. —*

In regard to the treatment of gun shot-wounds, I shall only remark, that as they will come more particularly under the head of contused wounds, so will be their treatment, the same as in all other contused wounds, varying only, according to the proportional extent of the injury sustained —

I shall therefore beg leave to pass them over altogether, for the more important consideration of fractures, of which I shall only venture a few remarks, and then will bring the subject to a close —

Of Fractures

The reunion of fractured bones, is effected in nearly the same manner as has been stated, by the influence of fibrous (not coagulating) lymph which becomes vascular & gradually by a deposition of bony

[illegible] rather consolidated into a bone —

In uniting [illegible] callus callus is at first soft, but gradually becomes firmer, and at length completely ossified — —

But in old subjects, and in peculiar constitutions, this callus is very slowly secreted, and the bones become first only connected by ligament, which is formed, and an artificial joint sometimes results. This may occur in any bone, though it is most frequently met with in the humerus, femur, and within the thigh bone, and most usually follows a compound fracture of the bone.

In some instances this can [illegible], various methods have been tried, viz. the [illegible] or tooth by removing it to the [illegible] bone, the patient for a time to use the limb, and may sometimes be effected. In some instances this has been known to create stiffness [illegible] —

[illegible] sufficient degree to effect a cure. [illegible] a part cutting down, and sawing off the end of the broken bone, has been known to succeed when every other remedy has failed. A case of this nature, which happened in the Penshouse is related by Dr. Wilson, in which Dr Anson, by sawing off the end of a dislocated, humerus, rendered to effect a perfect cure, after the seton had been twice ineffectually tried. —

But decidedly the best mode of treatment, I think, both on account of the facility of the operation, & consist of the patient, is the one first proposed, and so ably practised by our venerable [illegible] Dr Physick, to wit, the application of a ligature between the dislocated end of the bone. This operation, in many surgeons has been [illegible] in consequence of the erroneous idea that it could not succeed on the thigh bone. But that this position was groundless has been sufficiently proved by Dr. Physick, and other European surgeons

— As a further confirmation of the fact, the following case which came within my own knowledge, will show, that the question, cannot be entertained of a doubt —

A black man, belonging to Hughes, a respectable farmer of the County of Chester, State Virginia, had a compound fracture of the right leg, which by a neighboring physician, who is now at first called in, was treated, on the usual plan. But in consequence of some neglect, either on part of the practitioner, or in disobedience of the patient — the bones failed to unite; the cavity — which was having relapsed, and the ends of the bones still remained in the condition, it was thought advisable to call in another Physician; Accordingly, my preceptor, Dr: John R. Wilson, a graduate of the University, was consulted — Being however, this disease, a great favorite of the patient — a fair chance, and if he failed to effect the cure, without the use of the setons,

&c

He was once more induced, to try the empirical
ing, at first a little, with the hope, of at last effect
ing his purpose, without the necessity of so painful
an operation. But finding that every effort which
he made only proved fruitless, and contributed rat
her to protract, and increase the sufferings of his
patient, without answering any good purpose,
he at length resolved to try the seton, and accor
dingly on the 29th of Nov: 1817, agreeably to the direc
tions laid down by Dr. Physick, the operation was
performed, and in five or six weeks, to his great
satisfaction, a most perfect cure ensued. And the
Boy a fine healthy man, still continues with his
master, a living witness of the success of the operation,
and of its entire superiority over every other —

Thus Gentlemen, in the case above
you observe, that this operation has succeeded
in the os femoris, as well in our own, as in the Euro
pean Countries. And that instead of four or five
Months, the time usually allowed, a most perfect cure

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has been established in the short space, of five or six weeks. which proves more clearly, than any argument I could advance, that the success of this operation, must depend, as much on the age, constitution, and habits of the patient, as upon the superior skill, and judicious management of the attending Physician ——

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